

# How can I factor a polynomial?

Thursday  
Squares +  
cubes  
patterns

Always do this first!  
FACTOR OUT THE  
GCF!  
(greatest common factor)

FRIDAY

If it is a trinomial  
3 terms

Next step:  
Count the number of terms

If it is a 4  
term  
polynomial

Check for  
product/sum  
If "yes"

IF NO → PRIME

Blax

Product  
Sum

If it is a  
binomial  
(2 terms)

[Empty box]

How can I recognize a perfect square?  
1, 4, 9, 16, 25, 36,  
49, 64, 81, 100, 121,  
144, 169, 196, 225,  
256, 289, 324,  
361, 400

The exponents  
will be  
even  
 $x^2, x^4, x^6,$   
 $x^8, x^{10}, \dots$

Then look for  
one of these  
patterns

Do the terms contain  
only perfect squares  
or perfect cubes?

$x^3, x^6,$   
 $x^9, x^{12},$   
 $x^{15}, \dots$

How can I  
recognize a perfect  
cube?  
1, 8, 27, 64,  
125, 216, 343,  
512, 729, 1000

The exponents  
will be  
multiples  
of 3

Squares

IF neither → PRIME

Cubes

$$x^2 - y^2 = (x - y)(x + y)$$

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

OR

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

Don't forget  
to use  
S.O.A.P.!  
SAME,  
OPPOSITE,  
ALWAYS  
POSITIVE

Check:  $(x+12)(x-7)$

$x^2 - 7x + 12x - 84$   
 $x^2 + 5x - 84$

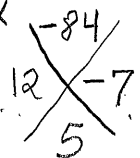
# Factoring Trinomials

Always, factor out the GCF first! You can always check your work by multiplying your factors together.

1. multiply the LC by the constant

a. Put this value on top of Big X

3. Put middle coefficient on bottom of Big X

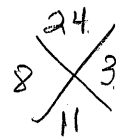


2.  $2x^3 + 22x^2 + 48x$

$2x(x^2 + 11x + 24)$

$2x(x+8)(x+3)$

Factor out the GCF



When the LC is 1 simply write the binomial factors.

1.  $x^2 + 5x - 84$

$(x+12)(x-7)$

TASK: Find 2 numbers whose product is -84 but whose sum is 5.

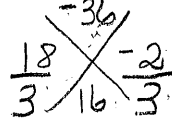
EXTRA STEPS REQUIRED WHEN LC ≠ 1

3.  $2x^2 + 9x + 4$



4.  $9x^2 + 48x - 36$

$3(3x^2 + 16x - 12)$



$3(x+6)(3x-2)$

## DEMONSTRATION

$(x + \frac{8}{2})(x + \frac{1}{2})$

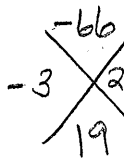
$(x+4)(2x+1)$

this is not the final answer!

divide the product/sum pair

by the LC. SIMPLIFY if possible.

5.  $2x^2 + 19x - 33$



PRODUCT, sum

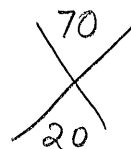
-1, 66	
-2, 33	
-3, 22	-3+22

$(x-3)(x+22)$

$(2x-3)(x+11)$

6.  $x^2 + 20x + 70$

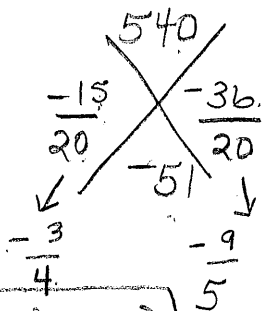
prime



There is no product/sum pair ∴ this trinomial is "prime"

	Sum
1, 70	71
2, 35	37
5, 14	19
7, 10	17
10, 7	17
14, 5	19
35, 2	37

7.  $20x^2 - 51x + 27$

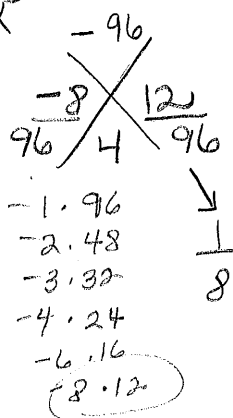


$(4x-3)(5x-9)$

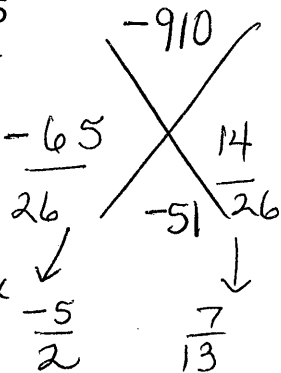
8.  $96x^5 + 4x^4 - x^3$  GCF:  $x^3$

$x^3(96x^2 + 4x - 1)$

$x^3(12x-1)(8x+1)$



9.  $26x^2 - 51x - 35$



$(2x-5)(13x+7)$

10.  $4x^7 + 120x^6 + 800x^5$

GCF!

$4x^5(x^2 + 30x + 200)$

$4x^5(x+20)(x+10)$

Use the tables in your calculator!

